RESEARCH

Cariboo Forest Region

- Making Research Work For You -

EXTENSION NOTE #4
February 1993

Site Disturbance and Reclamation

RESEARCH ISSUE GROUPS

- **Soil Conservation**
- **Wildlife Habitat**
- **Hydrology**
- **Forest Health**
- **Reforestation**
- **Stand Tending**
- **Ecosystem Inventory and Classification**
- **Biodiversity**
- **Guideline Verification**
- **Extension**

This Extension Note summarizes a series of field trips to observe and assess site disturbance and recommend treatments for any necessary rehabilitation.

INTRODUCTION

Machine travel during harvesting can cause soil compaction if conditions are not correct. This is usually taken to mean a simple increase in soil bulk density. However, soil compaction also means:

- reduced aeration porosity,
- loss of soil structure,
- reduced hydraulic and gas conductivity,
- thermal properties changes, and
- increased dry strength.

Compaction can reduce root growth, which limits the tree's ability to explore the soil volume for nutrients and moisture, with possible reduced mechanical stability. Other side effects include:

- increased risk of ponding of water,
- greater depth of soil freezing, and
- reduced growth of soil organisms.

Any of these changes can contribute to short term reductions in tree growth or long-term reductions in site productivity.

Site disturbance is often desirable and necessary to prepare soil for forest regeneration. Site disturbance is not necessarily detrimental disturbance. However, under certain conditions, such as a high risk of erosion, large amounts of any type of disturbance can be detrimental.

Reclamation is usually required when an area is detrimentally disturbed during harvesting.

RESEARCH Section, Ministry of Forests, Cariboo Forest Region
200 – 640 Borland Street, Williams Lake, BC V2G 4T1 Phone (250)398-4345
Fax (250)398-4380 http://www.for.gov.bc.ca/cariboo/research/research.htm

106-06358/

Reclamation is often very expensive and does not guarantee that an area can be returned to its former level of productivity. Therefore, **prevention is always the best way to deal with detrimental site disturbance.**

The objective of reclamation is to return the site as closely as possible to its initial level of productivity in such a manner that the site will maintain that level of productivity without further management. The first step in undertaking reclamation work is the development of the reclamation plan.

RECLAMATION PLAN

A reclamation plan must be based on specific site conditions, such as :

- moisture regime,
- soil texture,
- nutrient status,
- range and wildlife interests,
- possible negative consequences of the reclamation, and
- locally available options.

Flexibility in the development of reclamation plans is necessary with regard to the use of available resources and in addressing special concerns for the given site. For example, cultivation may be desirable, but the area never dry enough for it to be viable. Mulching may be initially desirable, but conventional mulches unavailable in an area. The risk of catastrophic erosion events may require action before other conditions, such as soil moisture, are suitable.

A wide variety of tools is needed to achieve the desired results for the many possible combinations of circumstances occurring for reclamation projects. Forest Sciences currently has several trials in place to develop new methodologies. More formal trials are planned for coming years to increase the options for addressing detrimental disturbance. Some of the options currently being explored are listed below.

RECONTOURING OF STEEP CUTS

Ground skidding on steep slopes can exceed maximum allowable disturbance levels if skid roads are not recontoured. Proper recontouring can even extend the slope steepness limits for ground skidding.

Skid roads can be built with an excavator and the topsoil taken off first, with any subsoil placed over the topsoil on the sidecast. When the road is recontoured, the material is pulled back onto the road in reverse order, with debris from the surrounding cutblock dragged over the exposed mineral soil. The soil should always be returned to its normal layering. If that is not possible, more debris can be dragged over the recontoured slope with planning for fertilization and mulching.

LOOSENING OF THE SOIL

Soil can be loosened by a variety of methods, including a ripper, winged ripper, winged subsoiler, excavator with bucket, or excavator with fork. The winged subsoiler and ripper are usually more applicable to large areas of continuous disturbance, such as roads and landings. The winged subsoiler must be used properly to be effective. Excavators are usually more useful for smaller areas of discrete disturbance located throughout the block.

The cultivation of large disturbed areas composed of many small patches of discrete disturbance, such as ruts, is not usually desirable. The excavator can deal with the worst areas in such a situation. Cultivation must be done when the soil is friable - when it is dry enough to crumble from cultivation but not so dry that it pulverizes. The soil should only be lifted to cause fracturing and fluffing and then dropped back without any inversion of the soil profile. Winged subsoilers may create minor trenches, but trenching is not the treatment intent.

Cultivated areas should not be trafficked after treatment, and the area must be planted immediately to a cover crop to prevent the soil from recompacting with rain or runoff. A potential time lag between cultivation and establishment of a complete ground cover requires consideration of mulches.

RESTORE ORGANIC MATTER

The layer of organic material on the forest floor surface serves many important functions. It is often an important nutrient reservoir, it prevents soil erosion, and it protects soil from compaction after the removal of vegetation. Vegetation plays an important role in maintaining soil structure and when removed, exposed mineral soils are more susceptible to compaction damage.

Several options exist for restoring organic matter. Forest floor or logging debris may be moved in from slash piles or roads. Old hay is a suitable mulch, because of its relative unpalatibility and lower carbon/nitrogen ratio. Hydroseeding mulches may be used in certain cases, or plants such as rye grain, which generally do not survive well in the Cariboo and die after one year, leave a layer of organic matter on the ground.

REVEGETATION

Traditional approaches have been to plant grass/legume mixtures, which are useful in extreme situations where erosion control is necessary. However, there are circumstances where these types of mixtures may compete for moisture with seedlings or may increase the risk of frost damage. In these cases there are other options, such as planting species that will die out quickly (rye or sweet clover) or form low-growing cover.

Grass/legume mixtures used for reclamation should be seeded at much higher rates than normally considered for establishment. The intent of a grass/legume mixture in reclamation is mainly to establish complete ground cover as quickly as possible. A lag between seeding and ground cover should include mulching in combination with seeding, or planting of conifers at higher than normal densities to tie up nutrients on the site. High root activity also helps restore and maintain soil structure.

FERTILIZATION

Fertilization replaces nutrients lost from the site, stimulates biological activity to speed up the process of soil structure restoration, and accelerates ground cover development. Nutrient application may also help to offset an anticipated decline in productivity when other means are not practical.

The best level and timing of fertilizer application depend on specific objectives and site conditions. Application rates must not be high enough to burn young seedlings or lead to nitrate poisoning in areas with high cattle use. Mature trees can withstand higher rates of fertilizer application than seedlings. Soil or tissue analysis may or may not be warranted depending on the nature of the problem. Simple nutritional adequacy is often only one aim of fertilizer application for reclamation.

MONITORING

All reclamation operations must be carefully monitored during and after the various treatments. The reclamation plan should include specific instructions that are carefully followed. Changes in plans require that amendments be approved before proceeding.

Monitoring treatment success is essential to build up a body of information for future treatment prescriptions under given circumstances. Forest Sciences is continuing to develop more options for logical and effective reclamation procedures that address a wide variety of site-specific circumstances.

CONTACT

For more information, contact **Bill Chapman** at 398-4718.